UNIVERSITI PUTRA MALAYSIA

EFFICIENCY AND DETERMINANTS OF ENTRY INTO MALAYSIAN PALM OIL REFINERY INDUSTRY

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EFFICIENCY AND DETERMINANTS OF ENTRY INTO MALAYSIAN PALM OIL REFINERY INDUSTRY

By

CHOO SZE YI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

August 2016

In loving memory of

Kevin Choo Yew Ching

Dedicated to my beloved parents:

Choo Yew Chun

Kow Lian Yoke

and my beloved family

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EFFICIENCY AND DETERMINANTS OF ENTRY INTO MALAYSIAN PALM OIL REFINERY INDUSTRY

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August 2016

Chairman : Associate Professor Alias Radam, PhD
Faculty : Economics and Management

The palm oil refinery industry became the key industry following the nation's economic transition plan in the early 1970s, where it is since known as the workhorse of palm oil industry. The refinery industry began to boom with the establishment of refineries in several states in the early days spreading in Peninsular Malaysia and to Sabah and Sarawak in recent years. The issues of efficiency and competitiveness of refinery industry are brought to question as to what causes the downtrend of capacity utilisation rate, why a refinery country has been importing refined palm oil and export crude palm oil (CPO) instead of producing processed palm oil (PPO) locally and the slow entry of new refineries.

This study aims to examine the entry and efficiency of the Malaysian palm oil refinery industry from the period of 2005 to 2013. The non-parametric Data Envelopment Analysis (DEA) approach of Malmquist Total Factor Productivity (TFP) indices are employed to examine efficiency of the industry, while the discrete choice logit model is adopted to identify factors related to entry in the industry.

The DEA approach includes panel data analysis of 34 Malaysian palm oil refinery firms. The empirical results indicate that only 14.7% of the firms in the industry are closed to the frontiers or on the frontier across all efficiency indices. On average, palm oil refinery industry has not been performing well with regress in four out of five efficiency indices. Technical efficiency change exhibits a drop of -0.3%, technological change declines -1.3%, pure efficiency change is down by -0.3%, and total factor productivity change declines -1.6% respectively. Scale efficiency change is the only indicator that shows slight progress of 0.1% over the estimation period of 2007 to 2013.

The empirical analyses of logit model are conducted using panel data of 52 Malaysian palm oil refinery firms. The empirical findings of logit model on all 52 firms indicate

that profit rate (positive), minimum efficient scale (negative) and distribution and marketing intensity (negative) variables exhibit expected coefficient signs and are significant. The logit analysis on 35 public listed firms is significant where profit rate (positive), growth (positive), minimum efficient scale (negative) and distribution and marketing intensity (negative) carried the expected coefficient signs. The statistically significant p-values of these analyses directly indicate that the overall influence of independent variables is considered significant on entry in this model.

Consumption and demand for palm oil will continue to rise in the future given its wide application in our daily lives. As palm oil industry is the key industry to the economic growth of Malaysia, it should be studied extensively to ensure its growth and development is in line with the world's need for the product. The empirical findings suggest that vertical integration is necessary to allow domestic refineries to enjoy complete supply chain in their production. Refineries would therefore be able to enjoy continuous inputs and cheaper raw materials for refining processing. It is also essential for refineries to boost productivity, efficiency and competitiveness in both domestic and global markets through adoption of advanced technologies in machineries, equipments and refinery plants. Refineries ought to amplify their production scale to attain economies of scale in production to enjoy lower cost advantage and higher utilisation rate. In addition, large scale entry through mergers and acquisition of small firms are necessary to expand the operation of small firms and to encourage healthy competition among refineries. Collaboration between government's agencies and refineries are essential in encouraging development in the said industry.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KECEKAPAN DAN PENENTU KEMASUKAN KE INDUSTRI PENAPISAN MINYAK SAWIT MALAYSIA

Oleh

CHOO SZE YI

Ogos 2016

Pengerusi : Professor Madya Alias Radam, PhD
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Industri penapisan minyak sawit menjadi industri utama berikutan peralihan polisi ekonomi negara pada awal 1970an, di mana ia dikenali sebagai tulang belakang industri minyak sawit. Industri penapisan mula berkembang dengan pesat berikutan penubuhan kilang penapisan di Semanjung Malaysia, Sabah dan Sarawak sejak kebelakangan ini. Isu-isu kecekapan dan daya saing industri penapisan dipersoalkan berikutan penurunan kadar pengunaan kapasiti, kadar kenaikan import minyak sawit yang diproses sedangkan Malaysia merupakan pengeksport minyak sawit yang diproses dan kemasukan firma penapis baru yang semakin kurang.

Kajian ini bertujuan untuk mengkaji daya saing dan kecekapan industri penapisan minyak sawit Malaysia dari tempoh tahun 2005 hingga tahun 2013. Pendekatan tidak-berparameter "Data Envelopment Analysis (DEA)" digunakan untuk mengira index jumlah faktor produktiviti Malmquist (TFP) untuk mengkaji kecekapan industri manakala model pilihan logit digunakan untuk mengenal pasti faktor-faktor kemasukan firma baru dalam mengkaji daya saing industri ini.

Analisis DEA menggunakan data panel 34 firma dalam industri penapisan minyak sawit di Malaysia. Hasil kajian menunjukkan bahawa hanya 14.7% firma dalam industri penapisan minyak sawit di Malaysia berada hampir di sempadan atau berada di atas sempadan. Secara purata, industri penapisan minyak sawit tidak menunjukkan prestasi yang baik dengan kemunduran empat daripada lima indek kecekapan. Kecekapan teknikal menunjukkan penurunan sebanyak -0.3%, kecekapan teknologi menurun sebanyak -1.3%, kecekapan tulen turun sebanyak -0.3% dan jumlah faktor produktivit turun sebanyak -1.6%. Kecekapan skala adalah satu-satunya indek yang menunjukkan kenaikan sebanyak 0.1% dalam tempoh tahun 2007 hingga tahun 2013.

Kajian empirikal model logit menggunakan data panel 52 firma dalam industri penapisan minyak kelapa sawit di Malaysia. Hasil kajian empirikal model logit yang melibatkan 52 firma menunjukkan bahawa pembolehubah kadar keuntungan (positif), pembolehubah skala cekap minimum (negatif) dan pembolehubah pengagihan dan pemasaran intensif (negatif) adalah tiga pembolehubah yang signifikan dan memaparkan tanda-tanda jangkaan yang betul dalam menentukan kemasukan firma baru ke dalam industri. Sementara itu, analisis untuk 35 firma yang tersenarai menunjukkan bahawa pembolehubah kadar keuntungan (positif), pembolehubah pertumbuhan (positif), pembolehubah skala cekap minimum (negatif) dan pembolehubah pengagihan dan pemasaran intensif (negatif) adalah signifikan dan memaparkan tanda-tanda jangkaan yang betul. Nilai-p yang signifikan bagi kedua-dua analisis ini menunjukkan bahawa pengaruh keseluruhan pembolehubah dianggap signifikan ke atas kemasukan firma dalam kajian ini.

Penggunaan dan permintaan untuk minyak sawit akan terus meningkat pada masa akan datang memandangkan penggunaan yang meluas dalam kehidupan seharian. Industri minyak sawit adalah merupakan industri utama kepada pertumbuhan ekonomi Malaysia. Oleh itu, ia perlu dikaji secara meluas untuk memastikan pertumbuhan dan pembangunan industri ini adalah selaras dengan keperluan dunia. Hasil kajian empirikal menunjukkan bahawa integrasi menegak adalah perlu untuk membolehkan firma-firma penapisan minyak sawit domestik menikmati rantaian bekalan yang lengkap dalam pengeluaran mereka. Ini juga dapat membantu firma-firma penapisan sawit menikmati input yang berterusan dan bahan-bahan mentah yang lebih murah untuk pemprosesan penapisan. Dalam meningkatkan produktiviti, kecekapan dan daya saing dalam pasaran tempatan dan antarabangsa, firma-firma juga digalakkan untuk menggunakan mesin, peralatan dan loji penapisan yang berteknologi canggih. Firma-firma penapisan juga patut meningkatkan skala pengeluaran mereka untuk mencapai skala ekonomi dalam pengeluaran untuk menikmati kos pengeluaran yang lebih rendah dan kadar penggunaan yang lebih tinggi. Di samping itu, kemasukan besar-besaran melalui penggabungan dan pengambilalihan firma-firma penapisan minyak sawit kecil adalah perlu untuk mengembangkan operasi firma-firma kecil dan untuk menggalakkan persaingan yang sihat di kalangan firma-firma penapisan minyak sawit. Kerjasama antara agensi kerajaan dan firma-firma penapisan minyak sawit adalah penting dalam menggalakkan pembangunan dalam industri ini.

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Thank you!

CHOO SZE YI
AUGUST 2016

I certify that a Thesis Examination Committee has met on 11 August 2016 to conduct the final examination of Choo Sze Yi on her thesis entitled "Efficiency and Determinants of Entry into Malaysian Palm Oil Refinery Industry" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

AE	Allocative Efficiency
CAP	Capital Requirements
CCM	Companies Commission of Malaysia
CE	Cost Efficiency
CPO	Crude Palm Oil
CR	Concentration Ratio
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DMI	Distribution and Marketing Intensity
EffCh	Efficiency Change / Technical Efficiency Change
EI	Entropy Index
ETP	Economic Transformation Programme
GDP	Gross Domestic Product
GINI	Gini Coefficient
HHI	Herfindahl-Hirshman Index
HKI	Hannah and Kay Index
ISCC	International Sustainability and Carbon Certification
IV	Instrumental Variables
MES	Minimum Efficient Scale
MPC	Malaysian Productivity Corporation
MPIC	Ministry of Plantation Industries and Commodities
MPOB	Malaysian Palm Oil Board
OECD	Organisation for Economic Co-operation and Development
PE	Pure Efficiency
PECh	Pure Efficiency Change
PEMANDU	Performance Management and Delivery Unit
PORAM	Palm Oil Refiners Association of Malaysia
PPO	Processed Palm Oil
Prod	Productivity
R&D	Research and Development
RE	Revenue Efficiency
REI	Relative Entropy Index
RM	Ringgit Malaysia
ROA	Return on Assets
ROE	Return on Equity
RSB	Roundtable on Sustainable Biofuels
RSPO	Roundtable on Sustainable Palm Oil
SE	Scale Efficiency
SECh	Scale Efficiency Change
SCP	Structure-Conduct-Performance

SMEs	Small and Medium Enterprises
SPRING	Standards, Productivity and Innovation Board Singapore
TE	Efficiency / Technical Efficiency
TechCh	Technological Change
TFP	Total Factor Productivity
TFPCh	Total Factor Productivity Change
USDA	United States Department of Agriculture
VRS	Variable Returns to Scale
2SLS	Two-Stage Least Square

CHAPTER 1

INTRODUCTION

1.1 An Overview of Malaysian Palm Oil Refinery Industry

Tremendous transformations have occurred in the economy of Malaysia since its independence in 1957. The palm oil refining industry became the key industry following the nation's economic transition plan in the early 1970s, where it is since known as the workhorse of the palm oil industry (Ahmad, 2012). The refining industry began to boom with the establishment of refineries in several states in the early days spreading in Peninsular Malaysia and to Sabah and Sarawak in recent years. The number of refineries in Malaysia has shown steady growth over the years with small fluctuation in several years. New firms were seen entering the industry while, some incumbents were taken over and some expanded their operations (Fold and Whitfield, 2012).

In 1976, Malaysia was the world's largest palm oil refining industry with the establishment of 15 refineries producing capacity of 800,000 tonnes of palm oil. In 2014, this industry had 54 refineries in operation, 15 others were under planning, and the total capacity approved amounted to 27.1 million tonnes. Consequently, those remain in the industry are deemed as efficient refineries. The palm oil refining industry is under the governance of Malaysian Palm Oil Board (MPOB), which was founded in 2000. MPOB has since taken the responsibility in ensuring quality and efficiency of the nation's palm oil industry.

The production of crude palm oil (CPO) in Malaysia has been growing steadily from 10.8 million tonnes in 2000 to 16.9 million tonnes in 2010, recording growth rate of 56.5% in the span of ten years. The production of CPO was rather high at 19.2 million tonnes in 2012 and the Malaysian CPO production continued to increase to the recent production of 19.9 million tonnes in 2015. The growth of CPO production amounted to 84.3% in a decade from 2000 to 2015, which is equivalent to an increase of 5.6% per annum. The production of processed palm oil (PPO) in 2008 was estimated at 26.9 million tonnes, while in 2012, production dropped to 25.3 million tonnes. Since then the production of Malaysian PPO continued to fluctuate and later on settled at 25.7 million tonnes in 2015. The capacity of Malaysian palm oil refining industry in 2009 was estimated at 19.3 million tonnes and grew to 23.7 milion tonnes in 2011. Soon after in 2012, the capacity of palm oil refining industry achieved 24.8 million tonnes and recorded slight increase to 26.1 million tonnes in 2014.

On the other hand, the Indonesian CPO production continued to expand from a mere 7.0 million tonnes in 2000 to 17.6 million tonnes in 2007, with an average increment of 21.6% annually. The Indonesian CPO production continued to leap to 26.5 million tonnes in 2012 and recorded an astounding production of 32.5 million tonnes in 2015. The Indonesian CPO back then was mostly exported to Malaysia for further processing as Indonesia was not actively involved in downstream processing. The refining capacity of Indonesian refining industry in 2009 was given as 15.3 million tonnes, while the capacity

in 2011 was estimated at 19.5 million tonnes. The refining capacity of Indonesia refining industry achieved 47.0 million tonnes in 2014. The Indonesian CPO production showed an increased of 24.2% per annum from 2000 to 2015, which is very impressive as compared to that of Malaysia's CPO production. In 2009, Malaysian refining industry showed an advantage of 4.0 million tonnes over Indonesia. However, in 2014, the refining capacity of Indonesia increased drastically and widened the gap with Malaysia to a huge difference of 20.9 million tonnes further indicating that the Malaysia is tailing Indonesia in the palm oil refining industry.

In 2011, Indonesia shifted its policy to build its refining industry and boost export of PPO. Stockpiling in the palm oil industry has been one of the main issues lingering the industry when it hit a record high of 2.6 million tonnes in 2012, and the stockpile of PPO was set at 1.02 million tonnes in 2014. With high stockpile, it was unlikely new firm would consider entering the industry. The historic stockpile was mainly due to the export duty restructuring by Indonesian government in October 2011 to favour its downstream sector by raising the duty structure of CPO and lowering the export duty for PPO to boost export and production of PPO in the country. In this aspect, the Malaysian refiners are rather uncompetitive in comparison to those of the Indonesian producers. With each tonne of CPO refined, domestic refineries were operating at negative profits. Indonesian CPO and PPO were relatively cheaper than that of Malaysia.

Due to the government's concern on the issue of competitiveness surrounding the palm oil sector, responsive step has been taken toward reducing export duty by abolishing the CPO export tax structure in January 2013 in which the existing export duty of CPO was set at 23% since 1970s. Henceforth, CPO stockpile in the country has somehow reduced to 1.93 million tonnes following the total abolishment in export duty for CPO. However, the move toward abolishing CPO export duty was seen as a disadvantage to the domestic refiners, primarily because of the limited supplies of CPO for domestic refining industry. Domestic refiners criticised that the zero export duty would drain out availability of CPO in the country, which would eventually lead to lower investments in the refining sector. The reason that domestic refining industry had attracted plenty of foreign investments for the past 25 years was due to ample CPO in the country (Damodaran, 2012). Consequently, upstream producers rushed to export CPO taking advantage of the zero export duty. Refiners feared this would cause drastic drop of investment in the refining industry and entry of new firms or expansion of existing refineries would be affected severely following limited availability of CPO for processing.

In order to allow Malaysia's refiners a more level playing field, the export duty on CPO was then raised to 4.5% in March 2013, but was obviously lower than that of Indonesia's, which was 7.5%. Accordingly, this is believed to have benefited the domestic refiners as more CPO is made available for domestic refineries. This may be one of the competitive strategies implemented by government to boost competitiveness of downstream producers particularly the domestic refinieries. However, the problem of competitiveness of the Malaysian refineries over Indonesian refineries still remain a big question mark, since the cost of production of the Malaysian refineries is relatively higher to that of its competitors'. This is indicated with the relocation plan of many of the domestic refineries to Indonesia.

Among the reasons that caused these refiners to relocate to Indonesia are due to the large amount of CPO available, lower production and labour cost, attractive tax structure that benefits producers in Indonesia, lucrative operating profits and abundance of land for palm oil development. Despite the fact that Malaysia does not impose any export duty on PPO, with the current tax structure offered by Indonesian government, cost of refining production in Indonesia is still cheaper than that of Malaysia. Hence, Malaysia becomes an unlikely destination for refiners to invest in palm oil refining activities. The shift of these big downstream producers would cause massive impact to domestic palm oil industry.

The capacity utilisation rate achieved by domestic refineries has been showing a downward trend where it plunged to the historic low of 54.29% in August 2012. In addition, the number of refineries under planning with no occurrence of entry is on the rise where the highest was recorded at 25 in 2010. It is worrying to note the declining trend of utilisation rate of these refineries and the lack of actual entry into the industry over the years. Domestic refiners would lose their market share in the global market if refiners did not enter or did not expand their refinery plants locally.

According to CEO of Palm Oil Refiners Association of Malaysia (PORAM), Mohammad Jaaffar Ahmad, excess capacity is crucial to the development and competitiveness of domestic refinery industry. He was quoted saying, "Malaysia has excess capacity and strong justification to keep CPO for our downstream industries. Every tonne export of CPO will mean loss of market potential for a tonne of processed oils."[1] Excess capacity in the refining industry is important in order to preserve Malaysia's position in palm oil refining industry against its closest rival, Indonesia. Accordingly, excess capacity in palm oil refining production is used to serve the growing downstream industry. As export of PPO in the global market intensified, domestic refineries should continue to expand their efficiencies to cater the growing market. It would thus be an indicator to attract entry of new firms into the industry.

1.2 Problem Statement

Capacity utilisation rate in the industry has been showing a downward trend over the years. In 2009, capacity utilisation rate was recorded at 88.82%, dropping to 75.86% in 2010 and recently it has dropped further to 64.68% in 2014. The utilisation rate hit the lowest record at 54.29% in August 2012 (MPOB, 2014). The weak demand for Malaysian PPO and uncompetitive pricing as compared to that of Indonesia is believed to have contributed toward this downward trend in capacity utilisation (Ng, 2012b). According to Ng (2012b), if the situations of limited CPO available domestically and plunging utilisation rate continues, domestic refiners would have to import CPO from aboard in order to boost their productivity and utilisation rate.

[1] Quoted from "Refiners cry foul", by Rupa Damodaran, published in New Strait Times, Business Times, July 23rd, 2012.

The scenario in Malaysian palm oil industry indicated that export of CPO was increasing from 1.9 million tonnes in 2007 to 4.7 million tonnes in 2014. In addition to that, import of PPO was estimated at 796 thousand tonnes in 2012. This is irrational because Malaysia as one of the largest refining countries and the largest exporter of PPO in the world should be exporting PPO and importing CPO for further processing instead. The scenario in Malaysia conversely proved otherwise. The issue of competitiveness of refining industry is brought to question as to what causes a refinery country to import refined palm oil and export CPO instead of producing PPO locally. The rise in import of PPO implied that refiners in Malaysia were losing out to producers in Indonesia (Ng, 2012a). Does the scenario in palm oil refining industry have to do with the entry condition of the market that led to insufficient supplies of PPO? With Indonesia pressing in and building its palm oil refining industry, Malaysia should be aware of this problem and extend competitiveness of its refining industry as compared to Indonesia.

On the other hand, a handful of large refiners have planned to shift their operations to Indonesia recently. For instance, KL Kepong announced to expand its refining businesses by building three refineries in Indonesia, Mewah Group ceased its refinery in Sabah to relocate and expand its refining activities in Indonesia. IOI Corporation is planning to build its refinery in Indonesia and Sime Darby planned to expand its refining plants in Indonesia. Wilmar planned to expand its existing refinery capacity in Indonesia by 50% in 2012. In addition to these big producers, Intercontinental Specialty Fats has planned to suspend its refining operation in Malaysia in order to shift its operation to Indonesia (Lim, 2012).

In recent years, entry of refineries in operation had been rather slow with 48 in 2005 and increased to 54 in 2014. An additional of six refineries was recorded by comparing entry between 1980 and 2010. The increase in the number of entry of refiners was exceptionally small for a span of thirty years. It is also worth noting that, refineries under planning were relatively high with 12 in 2006 and increased to 25 in 2010. Despite owning licenses to operate, these refineries did not enter the industry as planned. The issuance of licenses with no entry occurred draw concern over entry in the industry. This situation leads to the question as to what is the reason that refineries with licenses did not start operation as planned?

LMC International's[2] Dr James Fry estimated that refining capacity of Indonesian refiners would soon achieve 40 million tonnes from 24 million tonnes in 2011 (Ng, 2012a). It is predicted that with more refineries being built in Indonesia, Malaysia will soon lose its position in palm oil refining industry. In relation to analysis by Ng (2012a), palm oil refining industry's competitiveness is questioned and the future of this industry is rather bleak if Malaysia did not fight to sustain its position. Ng (2012a) boldly forecasted that if this situation persists, refineries in Malaysia would shut down within one to two years time.

[2] LMC International is known as a leading independent agribusiness consultancy company with offices around the world.

In order for this industry to remain competitive in terms of production and performance, this research hopes to study the determinants that cause entry of new potential refiners or expansion of existing refiners, as well as government's involvement in the industry. It is also essential to tackle the issue of entry and competitiveness of the domestic refiners in relation to improvement in its efficiencies in the world market. Henceforth, effective government policy can be drawn or implemented effectively through deeper understanding of entry behaviour of the potential entrants into the industry.

1.3 Objectives of the Study

The general objective of this study is to identify the efficiency and entry of the Malaysian palm oil refinery industry.

The specific objectives of the study are:

i. to determine the structure of palm oil refinery industry;
ii. to examine the total factor productivity of palm oil refinery industry; and
iii. to identify factor related to entry into the palm oil refinery industry.

1.4 Significance of the Study

Palm oil industry has a long history in Malaysia and has become one of the most important sectors to the Malaysian economy. Palm oil is the world's most consumed oils and fats with consumption of 58.16 million tonnes, which is 34.5% of total oils and fats consumed in 2014 based on statistics obtained from Oil Crops Yearbook, USDA (2015). It is also known as the most exported and demanded oils and fats, which is estimated at 46.35 million tonnes in 2014 where Malaysia supplied approximately 37.2% that is 19.15 million tonnes of palm oil to the world market. According to MPOB (2015), the exports of both crude palm oil and processed palm oil have been growing over the years, where in 2014 the export of crude palm oil hit all-time high of 4.7 million tonnes and 12.61 million tonnes respectively. Export value of palm oil and palm oil based products in 2014 was estimated at RM 66.07 billion, which was equivalent to 8.63% of Malaysia's export earnings as extracted from figures provided by Department of Statistics, Malaysia (2015).

According to MPOB (2014), annual production of palm oil has recorded continuous intensification of 369.61% from 1960 to 1970. The production figures continued to grow to 2.5 million tonnes and 6.2 million tonnes in 1980 and 1990 respectively. The growth has been slower in 2000; about 77.9% from 1990. The annual production of palm oil achieved 21.91 million tonnes as of 2014, ranked second in terms of production after Indonesia. Topping the chart as largest producer was Indonesia with production of 36.37 million tonnes in 2014. Nonetheless, 46 refinery factories were in operation in Malaysia in 2000 rising to 48 in 2005 with total capacity of 17.3 million tonnes. The number of refinery in Malaysia increased by 57% in ten years span from 2000 to 2010 and production capacity of 22.8 million tonnes in 2010. Production capacity of refineries in operation increased to 26.15 million tonnes in 2014.

Consumption and demand for palm oil will continue to rise in the future given its wide application in our daily lives. Palm oil industry is the key industry to the economic growth of Malaysia; therefore, it should be studied extensively to ensure its growth and development is in line with the world's need for the product. It is hoped that palm oil refining industry would continue to grow and remain resilient domestically and internationally. This study hopes to achieve a new insight in terms of the behaviour of the Malaysian palm oil refining industry and to ascertain the determinants of entry into the industry. Due to the importance of this industry to Malaysia's economy, it is crucial for the research to be done for the sake of the industry's long-term survival into the future.

1.5 Organisation of the Study

This study is organized as follows. Chapter One provides a general overview of this study inclusive of the issues surrounding the industry, problem statement, objectives of the study and significance of this study. Chapter Two provides the general discussion on the manufacturing sector in the country, issues and basic background of the Malaysian palm oil refinery industry, followed by incentives and polices related to the industry. Chapter Three provides the literature review on past studies on palm oil refinery industry, discussion on the importance of entry, followed by reviews on structure, efficiency and data envelopment analysis (DEA) using financial ratio, determinants of entry and review on the empirical models used previously. Chapter Four presents the methodology related to the objectives of the study, while Chapter Five will focus on the analysis and discussion of the results. Finally, the conclusion and policy implications of the study will be in Chapter Six.

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LIST OF PUBLICATIONS

The list of publications during the author's candidature is as follows:

Choo, S.Y. and Abd Jalil, S. (2014). Excess capacity and entry deterrence: The case of Malaysian palm oil refining industry. *Malaysian Management Journa*l, 18, 3-12.

Choo, S.Y., Radam, A. and Shamsudin, M.N. (2014). Strategic investment and excess capacity: The case of Malaysian palm biodiesel industry. *Malaysian Management Journal*, 18, 69-74.

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